[6351]-113
F.E.
BSC - 103 - BES : ENGINEERING CHEMISTRY
(2024 Pattern) (Credit System) (Semester - I)

Time : 2½ Hours]   *[Max. Marks : 70*
Instructions to the candidates:
   1) *Q.1 is compulsory.*
   2) *Solve Q.2 or Q.3, Q.4 or Q.5, Q.6 or Q.7, Q.8 or Q.9, Q.10 or Q.11.*

Q1) Multiple Choice Questions.   [10]

   a)   The colour of Metal -EDTA complex is _____
      i)   blue   ii)   wine red
      iii) pink   iv) colourless

   b)   The process of removing salts from brackish water is _____
      i)   desalination   ii)   degasification
      iii) distillation   iv) degradation

   c)   Which of the following electronic transition requires the highest energy
      i) $\sigma \to \sigma^*$ ii) $\eta \to \pi^*$
      iii) $\pi \to \pi^*$ iv) $\eta \to \sigma^*$

   d)   In conductometric titration between strong acid and strong base reaction, the conductance of the solution _____
      i)   decreases upto endpoint & then increases
      ii)   increases upto endpoint & then decreases
      iii) increases upto endpoint & then remains constant
      iv)   decreases upto end point & then remains constant

   e)   Polymers that do not become soft on heating & hard on cooling are _____
      i)   thermoplastic polymers   ii)   thermosetting polymers
      iii) thermoelastic polymers   iv) thermotropic polymers

P.T.O.

f) Graphene is _____ nanomaterial.

   i)   zero dimensional   ii)   one dimensional

   iii) two dimensional   iv) three dimensional

g) Kjeldahl's method is used for determination of _____

   i)   % N   ii)   % C

   iii) % 0   iv) % Ash

h) $NCV = GCV -$ _____ $\times H \times 587$ cal/gm.

   i)   0.9   ii)   0.09

   iii) 9.0   iv) 90.0

i) PBR gives an idea regrarding _____

   i)   Nature of oxide film formed ii) Rate of neutralisation

   iii) quality of fuel   iv) pH

j) The process of coating tin on steel to prevent it from rusting is called as _____

   i)   tinning   ii) galvanisation

   iii) annealing   iv) silver plating

Q2) a) What are scales & sludges? Explain the causes of scale formation in boiler. **[6]**

   b) Explain reverse osmosis process with figure. **[3]**

   c) The hardness of 50,000 litres of a water sample was removed by passing it through a zeolite softener. The softener required 250 litres of NaCl containing 100 gm/lit of NaCl for regeneration. Calculate hardness of water. **[3]**

OR

Q3) a) What is hardness of water? Explain the procedure of EDTA method for determination of total hardness. Give formula for total hardness and reactions involved. **[6]**

   b) Give cation & anion exchange reaction for deionisation of water containing $MgCl_2$. **[3]**

   c) 100 ml of water sample on titration with N/50 HCl required 7.6 ml for phenolphthalein end point & 15.2ml for total alkalinity reading. Identify type & amount of alkalinity present in water sample. **[3]**

Q4) a) State Beer's law and Lambert's law. Draw diagram of double beam spectrophotometer & state the function of any 2 components of spectrophotometer. **[6]**

b) Draw a labelled diagram of calomel electrode. Write its cell representation & give anyn 2 disadvantages. **[3]**

c) Define:- **[3]**

i) Specific conductance

ii) Motar conductance

iii) Cell constant

<div align="center">OR</div>

Q5) a) Explain various stages of pH metric titration for strong acid and strong base with titration curve and reaction involved init. Give any 2 applications of pH metry. **[6]**

b) Explain any 3 applications of conductometry. **[3]**

c) Define:- **[3]**

i) Auxochrome

ii) Hypso chromic shift

iii) Hyper chromic shift

Q6) a) What are bio degradable polymers? Explain factors responsible for bio degradation. Draw structure of (biopol) PHBV & give its 2 applications. **[6]**

b) Give structure, 2 properties & 2 applications of polycarbonate. **[3]**

c) What are quantum dots? Give any 2 types of quantum dots. Write any 2 applications of it. **[3]**

<div align="center">OR</div>

Q7) a) Explain structure of graphene with diagram. Give its 3 properties and 3 applications. **[6]**

b) What are nanomaterials? Classify it on the basis of zero and one dimensional with respect to example of each. **[3]**

c) Define conducting polymers. Explain p-doping with reaction. **[3]**

Q8) a) What is proximate Analysis? Explain the procedure with formula used for determination of various constituents. **[6]**

b) What are Li ion batteries? Explain its construction. **[3]**

c) The following observations were noted in Boy's gas calorimeter experiment- **[3]**

Volume of gas burnt at STP = 0.1 m^3,

Mass of cooling water used = 27kg,

Temperature of inlet & outlet water are 24ºC & 29ºC respectively.

Mass of steam condensed = 0.04kg

Find GCV and NCV of the fuel

OR

Q9) a) Explain production of hydrogen gas by steam reforming of methane & coke with reaction conditions & method for removal of CO_2 gas. **[6]**

b) Give preparation with reaction of power alcohol. **[3]**

c) 2.4 gm of coal in quantitative analysis gave 0.20 gm of $BaSO_4$. Calculate % Sm the coal. **[3]**

Q10) a) What is wet corrosion? Give the conditions under which wet corrosion occurs. Explain hydrogen evolution mechanism of wet corrosion. **[6]**

b) i) Explain any 3 factors affecting rate of corrosion with respect to nature of metal. **[3]**

ii) What are anodic & cathodic coatings? Which is better? **[3]**

OR

Q11) a) Explain cathodic protection method using sacrificial anode with figure. Give any 2 advantages & any 2 applications of it. **[6]**

b) i) Explain the process of galvanising on steel with the help of suitable diagram. **[3]**

ii) Give the reaction & type of oxide film formed in the oxidation corrosion of Cr & Mo metal. **[3]**

✻ ✻ ✻